IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Qingyuan et al.	)
Serial No.:	09/864,003	) Group Art Unit: 1746
Filed:	May 23, 2001	)
For:	PLASMA PROCESS FOR REMOVING POLYMER AND RESIDUES FROM SUBSTRATES	) Examiner: Markoff, Alexander

DECLARATION PURSUANT TO 37 C.F.R. § 1.132

VIA FACSIMILE TO: 703-872-9310
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

I, Carlo Waldfried, declare and state:

1. My educational background includes a Masters of Science in physics from the University of North Dakota and a Ph.D. in Physics from the University of Nebraska.

2. I have been employed by Axcelis Technologies, Inc. since December 1999, where I am currently a Principal Scientist in the Advanced Technologies Group at Axcelis Technologies, Inc. in Rockville, Maryland.

3. I am an inventor or co-inventor on at least 3 U.S. patents assigned to the Axcelis

Technologies, Inc. and at least 9 pending applications relating to plasma processing and plasma apparatuses.

4. I am an inventor of the invention claimed in the above-identified application.

5. I designed and supervised residual gas analysis (RGA) studies for analyzing the amounts of atomic and molecular hydrogen and oxygen species generated from various gas mixtures that were exposed to microwave energy to form plasma.

6. A sample RGA spectrum is attached hereto as Figure 1. The RGA spectrum was generated by sampling the gas/plasma in the chamber of an Axcelis ES downstream plasma asher in which a gas mixture was excited therein by microwave energy. The plasma was generated from a gas mixture of oxygen gas (O_2) at 1,160 standard cubic centimeters per minute (sccm), forming gas at 720 sccm, and carbon tetrafluoride gas (CF_4) at 120 sccm. The plasma asher was operated at a power of 1,700 Watts, a pressure of 1.5 Torr, and a temperature of 105°C.

7. The spectra were obtained with microwave power ON and OFF. The dissociation of H_2 molecule into H atoms can be noted when the gas turns into plasma, in the form of a much diminished H_2 peak. (There is no peak corresponding to H-atom at amu '1' since the RGA is not sensitive to it). Similarly, the decrease in the molecular O2 peak corresponds to dissociation into O-atoms. A comparison of the H and O partial pressures in the Figure (based on decreases in O2 and H2 peaks upon plasma ignition) indicates that there is at least as much atomic H as atomic O in the plasma. As such, the plasma generated from the gas mixture at the stated operating conditions provides neutral plasma as defined by Applicants in its invention. However, using the Examiner's gas flow calculation as noted in the Final Office Action, the gas mixture would be

considered an oxidizing plasma.

8. As clearly demonstrated in Figure 1, the generation of atomic species in a plasma environment from a gas mixture cannot be simply correlated to the flow ratios of the components of the plasma gas mixture.

9. The final ratio of atomic hydrogen and atomic oxygen species generated from a gas mixture is based on many factors, including, but not limited to the following: the presence of other gases such as water vapor, the pressure in the reactor, the applied power, the dissociation efficiency, the distance from the generation region to the substrate surface, interactions between species, surface recombination effects (that affect individual species differently), and the like.

10. I further declare that all statements and representations made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements and representations were made with the knowledge that willful false statements and the like, so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued therefrom.

3/25/2004
Dated

C. W
Carlo Waldfried, Ph.D.

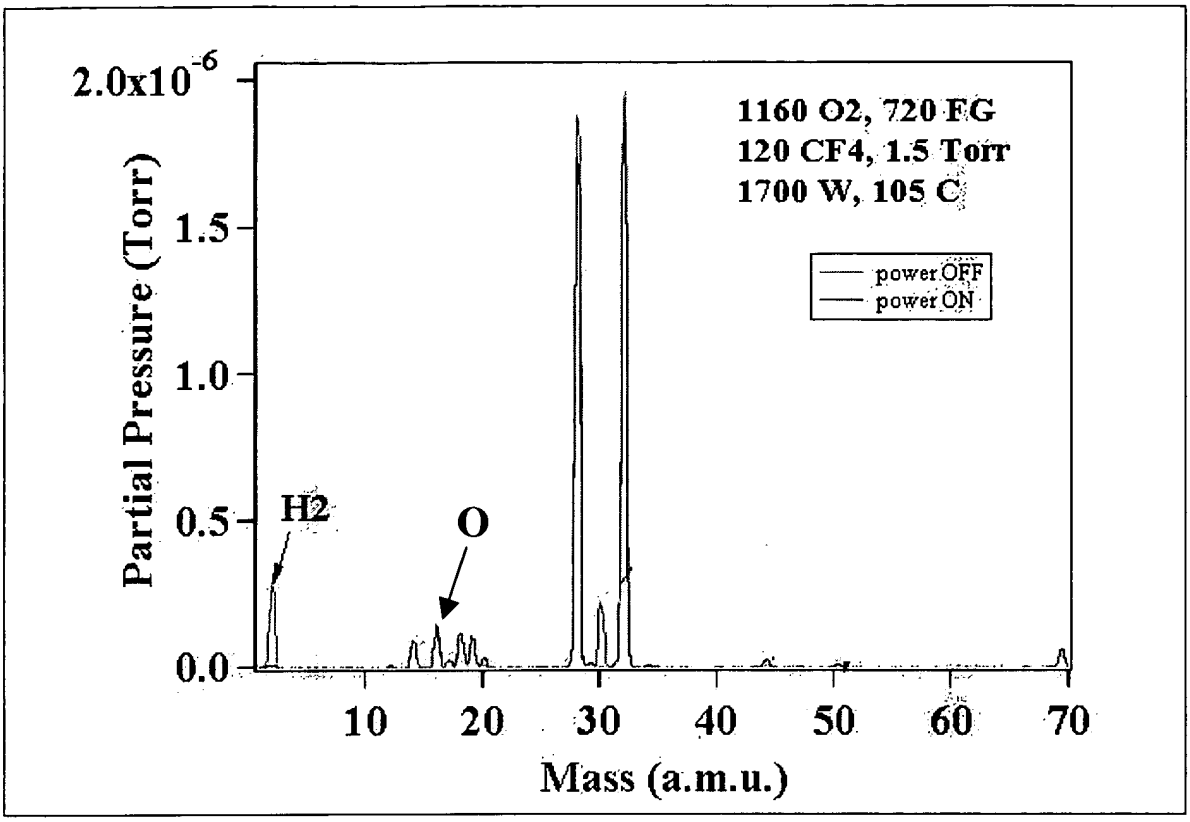

Figure1